

Study Guide

For use with pages 269–274

GOAL Find ratios and unit rates.**VOCABULARY**A **ratio** uses division to compare two quantities.Two ratios are called **equivalent ratios** when they have the same value.**EXAMPLE 1** Writing Ratios

In tennis class, you have won 15 out of 24 matches. You have lost 9 matches. Write the ratio in three ways.

- The number of wins to the number of losses
- The number of wins to the total number of matches

Solution

$$\text{a. } \frac{\text{Number of wins}}{\text{Number of losses}} = \frac{15}{9} = \frac{5}{3}$$

Three ways to write the ratio are $\frac{5}{3}$, 5 to 3, and 5 : 3.

$$\text{b. } \frac{\text{Number of wins}}{\text{Total number of matches}} = \frac{15}{24} = \frac{5}{8}$$

Three ways to write the ratio are $\frac{5}{8}$, 5 to 8, and 5 : 8.

Exercise for Example 1

- Using the tennis information above, compare the total number of matches to the number of matches lost using a ratio. Write the ratio in three ways.

EXAMPLE 2 Comparing and Ordering Ratios

Order the ratios 5 : 11, 13 : 23, and 3 : 7 from least to greatest.

Solution

Write each ratio as a fraction. Then use a calculator to write each fraction as a decimal. Round to the nearest hundredth and compare the decimals.

$$\frac{5}{11} \approx 0.45 \qquad \frac{13}{23} \approx 0.57 \qquad \frac{3}{7} \approx 0.43$$

Answer: The ratios, from least to greatest, are 3 : 7, 5 : 11, and 13 : 23.

Exercises for Example 2

Order the ratios from least to greatest.

- 5 to 12, $\frac{8}{11}$, 3 : 5
- $\frac{1}{3}$, 3 : 10, 21 to 65
- $\frac{7}{12}$, 5 to 11, 18 : 37

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EXAMPLE 3 Finding a Unit Rate

You pay \$3.45 for 15 ounces of cereal. What is the cost per ounce?

Solution

First, write a rate comparing the total cost of the cereal to the total amount of cereal. Then rewrite the rate so the denominator is 1.

$$\begin{aligned}\frac{\$3.45}{15 \text{ oz}} &= \frac{\$3.45 \div 15}{15 \text{ oz} \div 15} && \text{Divide numerator and denominator by 15.} \\ &= \frac{\$0.23}{1 \text{ oz}} && \text{Simplify.}\end{aligned}$$

Answer: The cereal costs \$.23 per ounce.

EXAMPLE 4 Using Equivalent Rates

A proposed hypersonic plane will be able to travel at a rate of 5040 miles per hour. How many feet will the plane be able to travel in 0.5 second?

Solution

(1) Express the plane's rate in miles per second.

$$\frac{5040 \text{ mi}}{1 \text{ h}} = \frac{5040 \text{ mi}}{1 \text{ h}} \cdot \frac{1 \text{ h}}{60 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} = \frac{1.4 \text{ mi}}{\text{sec}}$$

Multiply by conversion factors, divide out common units, and simplify.

(2) Find the distance (in feet) that the plane travels in 0.5 second.

Distance = Rate • Time

$$\begin{aligned}&= \frac{1.4 \text{ mi}}{\text{sec}} \cdot 0.5 \text{ sec} \\ &= 0.7 \text{ mi} \\ &= 0.7 \text{ mi} \cdot \frac{5280 \text{ ft}}{\text{mi}} \\ &= 3696 \text{ ft}\end{aligned}$$

Write formula for distance.

Substitute values. Divide out common unit.

Multiply.

Multiply by conversion factor.
Divide out common unit.

Simplify.

Answer: The plane will be able to travel 3696 feet in 0.5 second.

Exercises for Examples 3 and 4

Find the unit rate.

5. $\frac{60 \text{ songs}}{5 \text{ hours}}$

6. $\frac{\$50}{10 \text{ min}}$

7. $\frac{\$1315}{20 \text{ people}}$

8. $\frac{\$17.60}{5 \text{ yd}}$

Write the equivalent rate.

9. $\frac{140 \text{ mi}}{1 \text{ h}} = \frac{? \text{ ft}}{1 \text{ min}}$

10. $\frac{90 \text{ km}}{1 \text{ h}} = \frac{? \text{ cm}}{1 \text{ sec}}$

11. $\frac{\$3600}{1 \text{ day}} = \frac{? \text{ dollars}}{1 \text{ min}}$